20020 EP 0764907

FIG.1

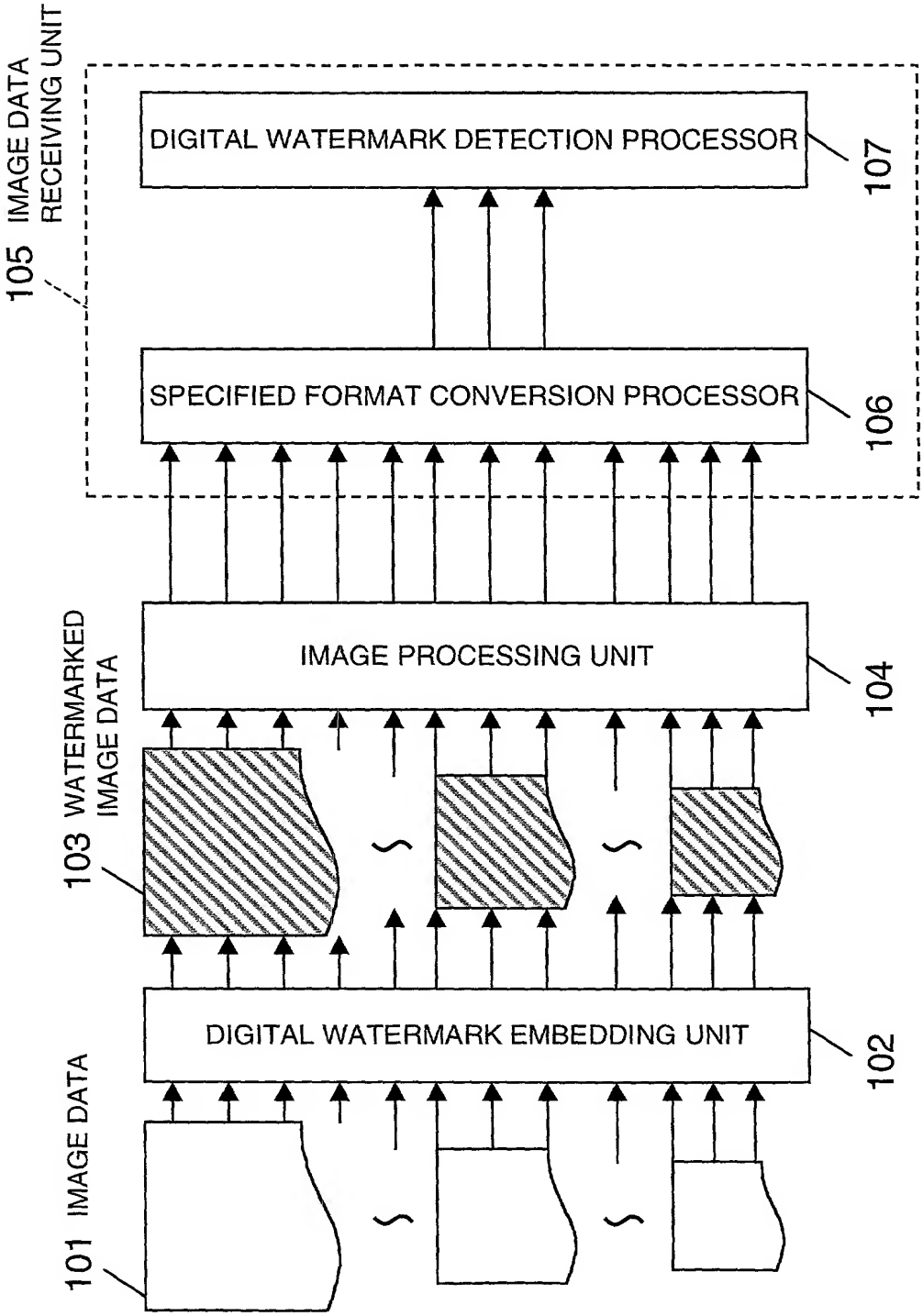


FIG.2

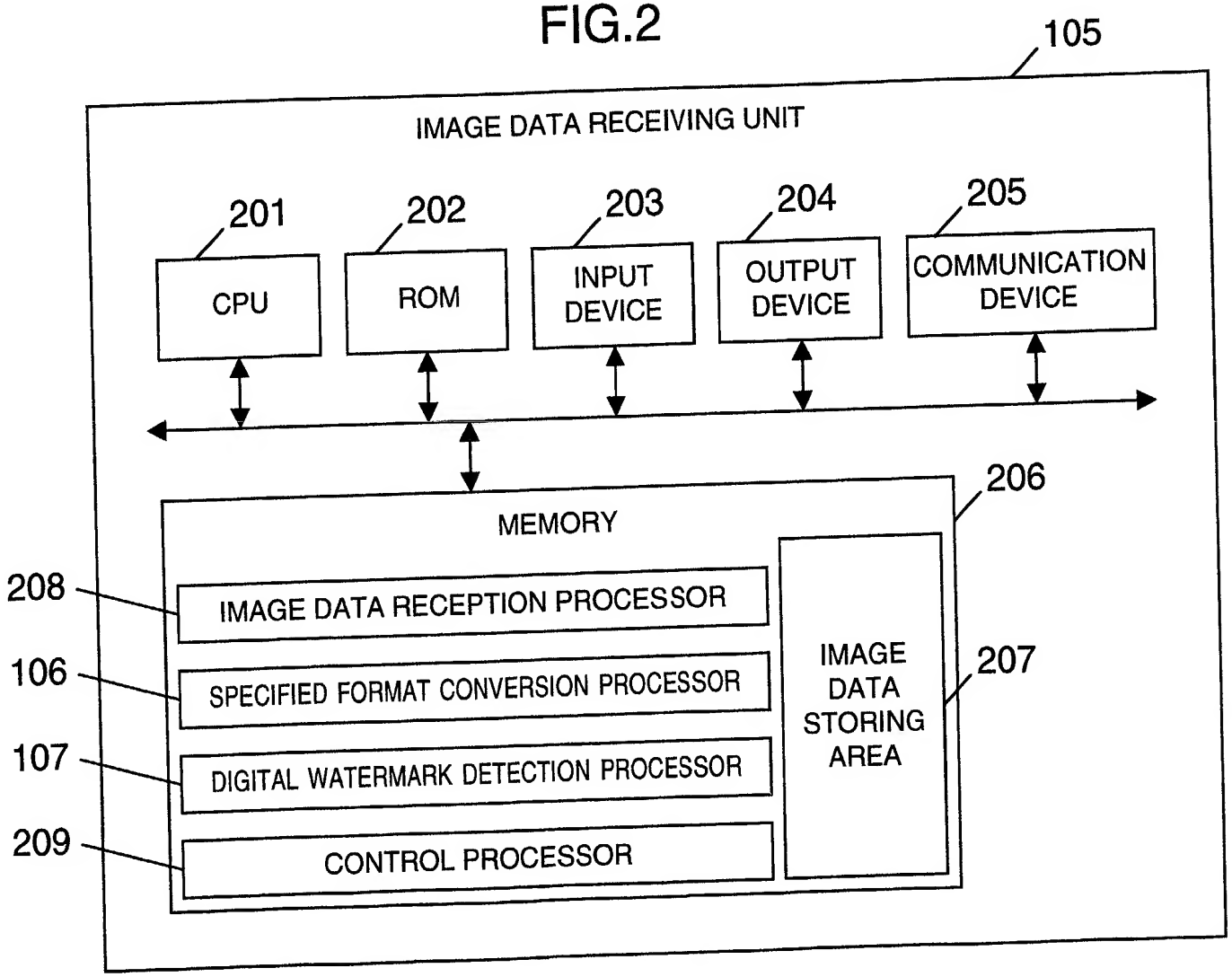

105
IMAGE DATA RECEIVING UNIT
201
CPU
202
ROM
203
INPUT DEVICE
204
OUTPUT DEVICE
205
COMMUNICATION DEVICE
206
MEMORY
208
IMAGE DATA RECEPTION PROCESSOR
106
SPECIFIED FORMAT CONVERSION PROCESSOR
107
DIGITAL WATERMARK DETECTION PROCESSOR
209
CONTROL PROCESSOR
IMAGE DATA STORING AREA
207

FIG.3

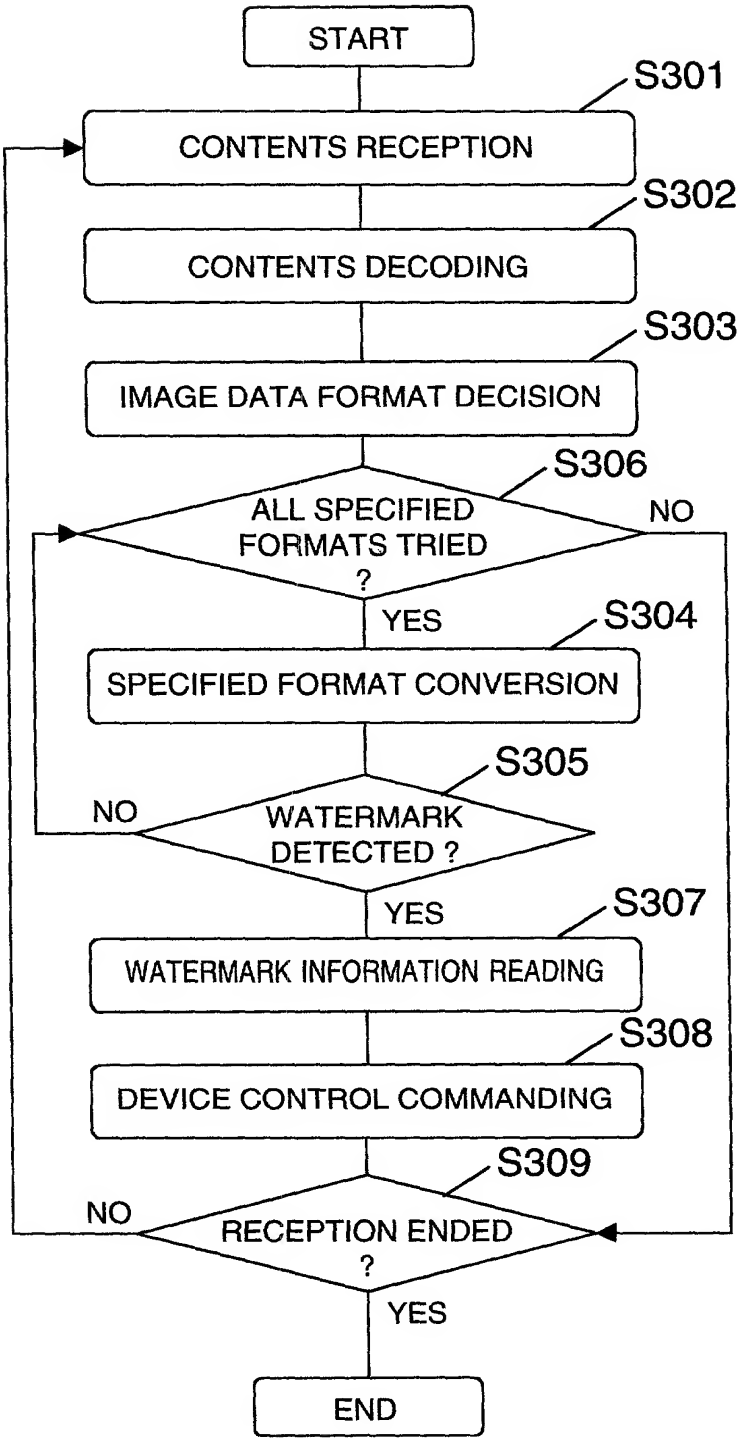

START
S301
CONTENTS RECEPTION
S302
CONTENTS DECODING
S303
IMAGE DATA FORMAT DECISION
S306
ALL SPECIFIED FORMATS TRIED ?
NO
YES
S304
SPECIFIED FORMAT CONVERSION
S305
NO
WATERMARK DETECTED ?
YES
S307
WATERMARK INFORMATION READING
S308
DEVICE CONTROL COMMANDING
S309
NO
RECEPTION ENDED ?
YES
END

FIG.4

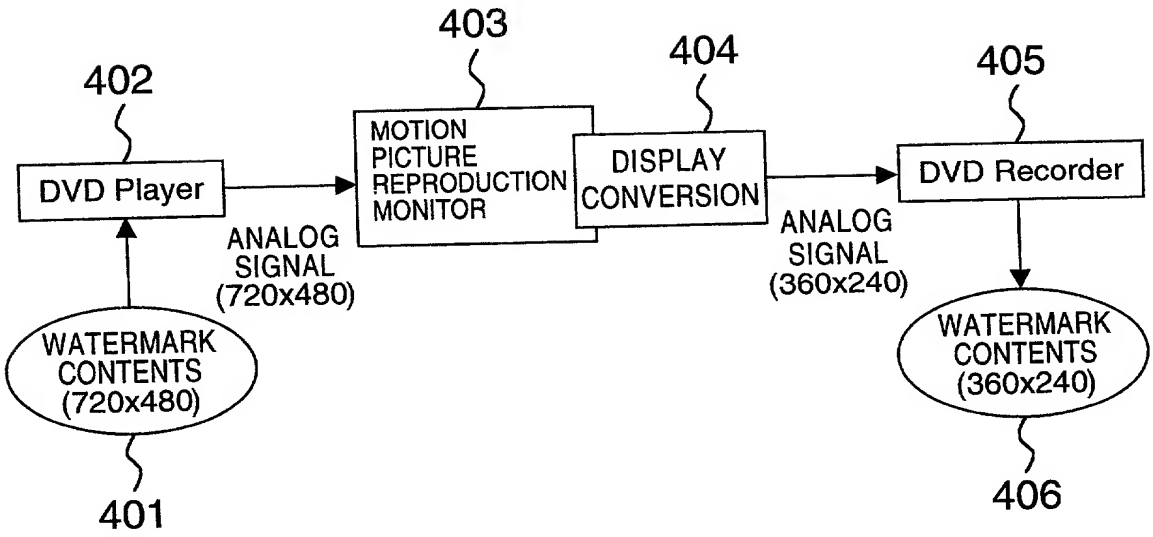

403
404
405
402
MOTION PICTURE REPRODUCTION MONITOR
DISPLAY CONVERSION
DVD Player
DVD Recorder
ANALOG SIGNAL (720x480)
ANALOG SIGNAL (360x240)
WATERMARK CONTENTS (720x480)
WATERMARK CONTENTS (360x240)
401
406

FIG.5

611 TRANSFORMATION PATTERN SEQUENCE HOLDER

PARAMETER	PRIORITY ORDER	TRANSFORMATION PATTERN		READ FLAG	SUCCESS FREQUENCY
		TRANSFORMATION	ROTATION		
0	1	WITHOUT TRANSFORMATION	0°	1	2
1	2	HD → SD	0°	1	1
2	3	HD → SD	90°	0	0
3	4	REVERSE	0°	0	0
4	5	SD → HD	0°	0	0
•	•	•	•	•	•
•	•	•	•	•	•
•	•	•	•	•	•

FIG.6

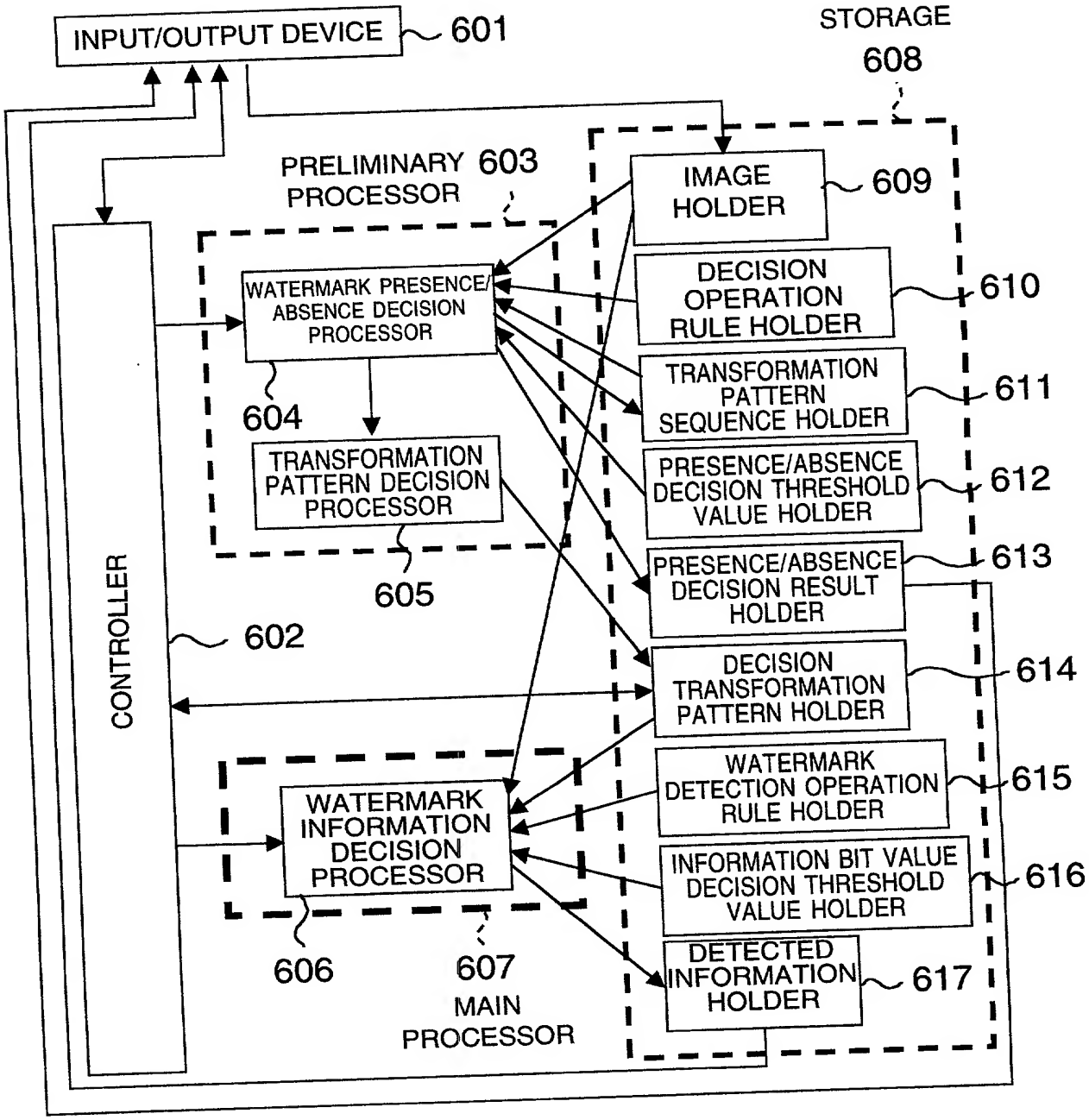

INPUT/OUTPUT DEVICE
601
STORAGE
608
PRELIMINARY PROCESSOR
603
IMAGE HOLDER
609
WATERMARK PRESENCE/ ABSENCE DECISION PROCESSOR
DECISION OPERATION RULE HOLDER
610
TRANSFORMATION PATTERN SEQUENCE HOLDER
611
604
TRANSFORMATION PATTERN DECISION PROCESSOR
PRESENCE/ABSENCE DECISION THRESHOLD VALUE HOLDER
612
PRESENCE/ABSENCE DECISION RESULT HOLDER
613
605
CONTROLLER
602
DECISION TRANSFORMATION PATTERN HOLDER
614
WATERMARK DETECTION OPERATION RULE HOLDER
615
WATERMARK INFORMATION DECISION PROCESSOR
INFORMATION BIT VALUE DECISION THRESHOLD VALUE HOLDER
616
DETECTED INFORMATION HOLDER
617
606
607
MAIN PROCESSOR

FIG.7

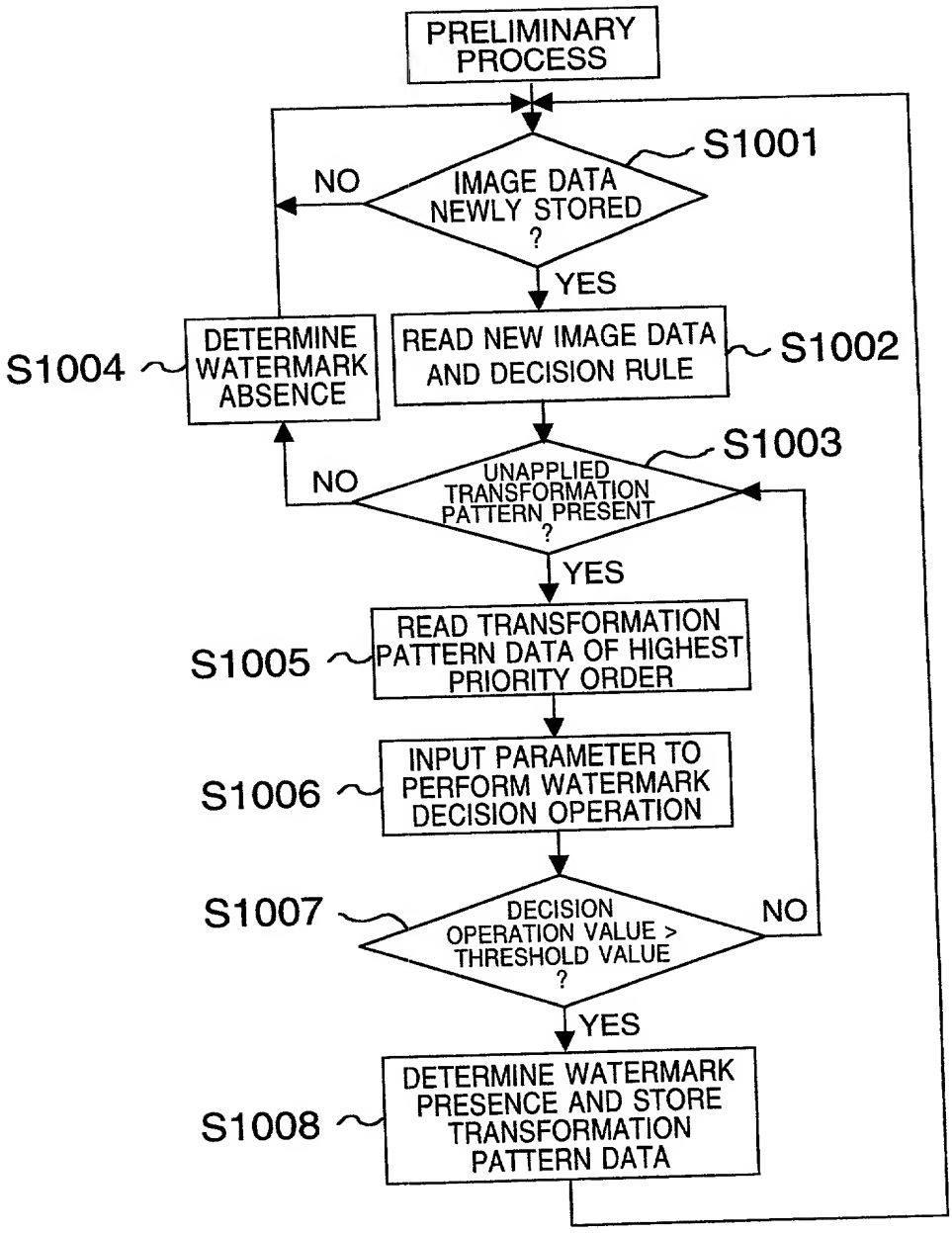

PRELIMINARY PROCESS
S1001
IMAGE DATA NEWLY STORED ?
NO
YES
S1004
DETERMINE WATERMARK ABSENCE
READ NEW IMAGE DATA AND DECISION RULE
S1002
S1003
UNAPPLIED TRANSFORMATION PATTERN PRESENT ?
NO
YES
S1005
READ TRANSFORMATION PATTERN DATA OF HIGHEST PRIORITY ORDER
S1006
INPUT PARAMETER TO PERFORM WATERMARK DECISION OPERATION
S1007
DECISION OPERATION VALUE > THRESHOLD VALUE ?
NO
YES
S1008
DETERMINE WATERMARK PRESENCE AND STORE TRANSFORMATION PATTERN DATA

FIG.8

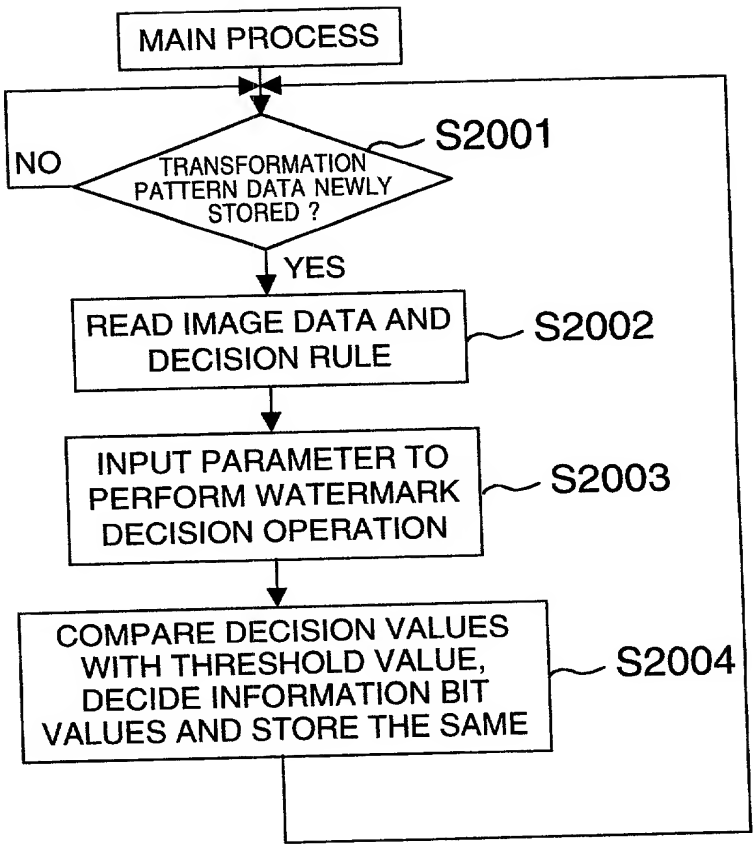

MAIN PROCESS
S2001
NO
TRANSFORMATION PATTERN DATA NEWLY STORED ?
YES
READ IMAGE DATA AND DECISION RULE
S2002
INPUT PARAMETER TO PERFORM WATERMARK DECISION OPERATION
S2003
COMPARE DECISION VALUES WITH THRESHOLD VALUE, DECIDE INFORMATION BIT VALUES AND STORE THE SAME
S2004

FIG.9

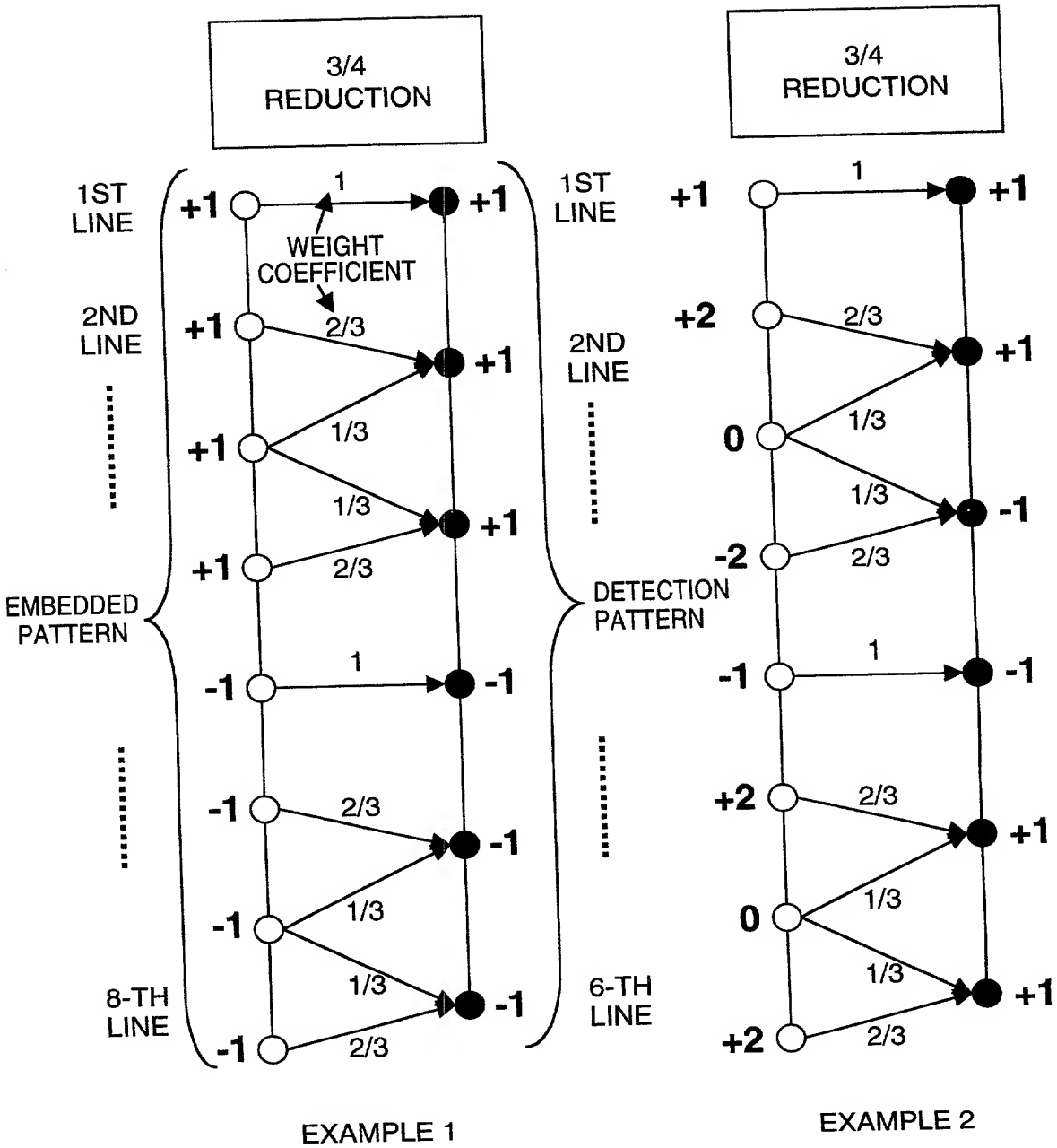

3/4 REDUCTION
3/4 REDUCTION
1ST LINE
2ND LINE
8-TH LINE
EMBEDDED PATTERN
WEIGHT COEFFICIENT
1
2/3
1/3
1ST LINE
2ND LINE
6-TH LINE
DETECTION PATTERN
+1
-1
0
+2
-2
EXAMPLE 1
EXAMPLE 2

FIG.10

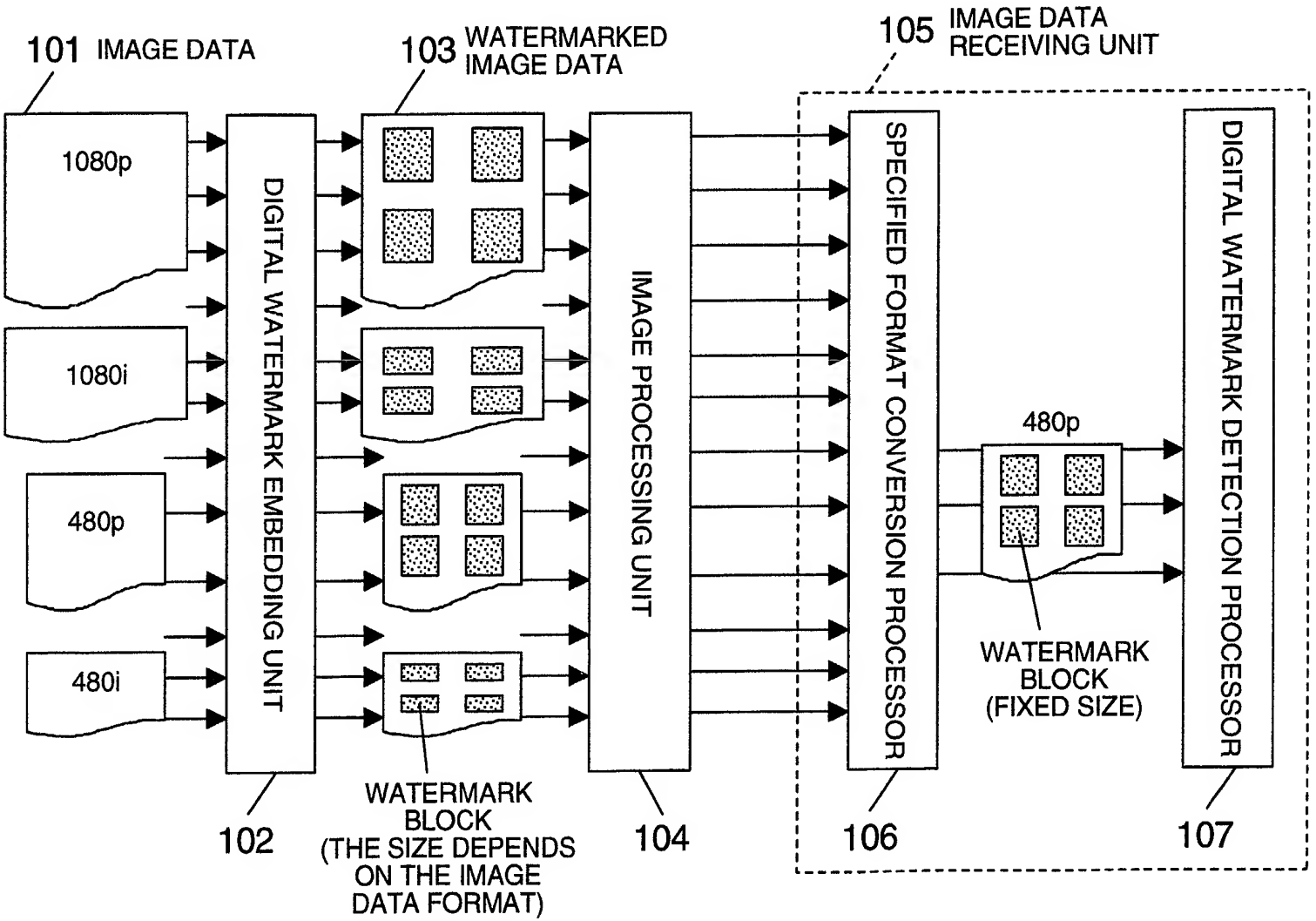
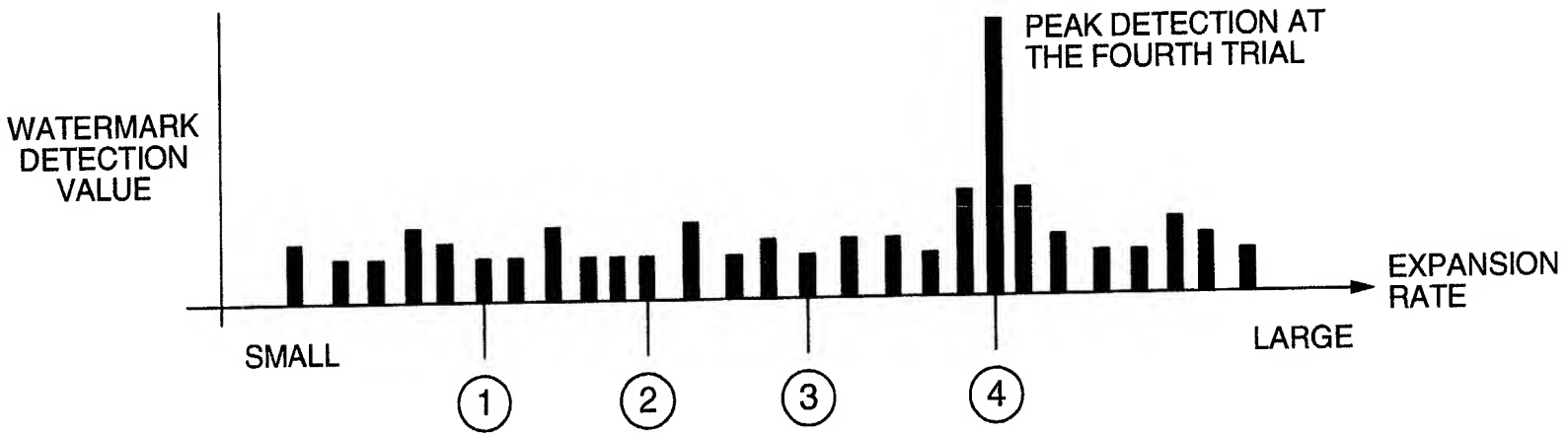

101 IMAGE DATA
1080p
1080i
480p
480i
DIGITAL WATERMARK EMBEDDING UNIT
102
103 WATERMARKED IMAGE DATA
WATERMARK BLOCK (THE SIZE DEPENDS ON THE IMAGE DATA FORMAT)
IMAGE PROCESSING UNIT
104
105 IMAGE DATA RECEIVING UNIT
SPECIFIED FORMAT CONVERSION PROCESSOR
106
480p
WATERMARK BLOCK (FIXED SIZE)
DIGITAL WATERMARK DETECTION PROCESSOR
107

FIG.11


PEAK DETECTION AT
THE FOURTH TRIAL
WATERMARK
DETECTION
VALUE
EXPANSION
RATE
SMALL
LARGE
1
2
3
4